

AMENDMENTS TO THE CLAIMS

Please cancel claims 1-7, 14, and 15, amend claims 8-13, and add claims 16-22 as set forth below.

Claims 1-7 (CANCELED).

8. (CURRENTLY AMENDED) An image processing apparatus for converting the resolution of an original image in such a manner as to increase the spatial resolution of said original image by a factor of Z in each of vertical and horizontal directions, said image processing apparatus comprising:

energy calculating means for calculating local energy of said original image based on two rows of pixels in said original image;

detection means for detecting the direction of an edge based on said local energy calculated by said energy calculating means;

interpolation means for interpolating a new pixel from a pixel of said original image based on the direction of the edge detected by said detection means;

edge enhancement means for performing an edge enhancement process based on said local energy calculated by said energy calculating means; and

consistency judging means for judging the consistency in terms of the local structure of the new pixel interpolated by said interpolation means, wherein said interpolation means performs linear interpolation to generate a second new pixel from two pixels lying along the detected direction of the edge when said consistency judging means determines that a value obtained by multiplying a first difference and a second difference is negative, wherein the first difference is obtained by subtracting the new pixel value from the pixel value of a pixel located at the center of the upper row, and wherein the second difference is obtained by subtracting the pixel value of a pixel located at the center of the lower row from the new pixel value.

9. (CURRENTLY AMENDED) The image processing apparatus according to ~~Claim 1~~ claim 8, wherein said energy calculating means creates an energy map having a size corresponding to the size of said original image and calculates local energy of said original image by subtracting pixel values of pixels located in a right column of the original image from corresponding pixel values of pixels located in a left column of the original image, calculating an absolute value for each pixel value difference, and calculating a sum of the absolute values,

wherein the pixels in the right column of the original image are diagonally spaced from the corresponding pixels in the left column of the original image.

10. (CURRENTLY AMENDED) The image processing apparatus according to ~~Claim 1~~ claim 8, wherein said interpolation performed by said interpolation means is at least one of a first interpolation and second interpolation, and when the value of Z is equal to or greater than 2, said interpolation means performs the first interpolation and said edge enhancement means performs the edge enhancement, until Z is less than 2, and when the value of Z is smaller than 2 said interpolation means performs the second interpolation and said edge enhancement means performs the edge enhancement.

11. (CURRENTLY AMENDED) An image processing method of converting the resolution of an original image in such a manner as to increase the spatial resolution of said original image by a factor of Z in each of vertical and horizontal directions, said image processing method comprising the steps of:

calculating local energy of said original image based on two rows of pixels in said original image;

detecting the direction of an edge based on said local energy calculated in said energy calculating step;

interpolating a new pixel from a pixel of said original image based on the direction of the edge detected in said detection step;

performing an edge enhancement process based on said local energy calculated in said energy calculating step;

judging the consistency in terms of the local structure of the new pixel interpolated by said interpolation means;

performing linear interpolation to generate a second new pixel from two pixels lying along the detected direction of the edge when the consistency judging determines that a value obtained by multiplying a first difference and a second difference is negative;

subtracting the new pixel value from the pixel value of a pixel located at the center of the upper row to obtain the first difference; and

subtracting the pixel value of a pixel located at the center of the lower row from the new pixel value to obtain the second difference.

12. (CURRENTLY AMENDED) A storage medium storing a computer-readable program for controlling an image processing apparatus to convert the resolution of an original image in such a manner as to increase the spatial resolution of said original image by a factor of Z in each of vertical and horizontal directions, said program comprising the steps of:

calculating local energy of said original image based on two rows of pixels in said original image;

detecting the direction of an edge based on said local energy calculated in said energy calculating step;

interpolating a new pixel from a pixel of said original image based on the direction of the edge detected in said detection step; and

performing an edge enhancement process based on said local energy calculated in said energy calculating step;

judging the consistency in terms of the local structure of the new pixel interpolated by said interpolation means;

performing linear interpolation to generate a second new pixel from two pixels lying along the detected direction of the edge when the consistency judging determines that a value obtained by multiplying a first difference and a second difference is negative;

subtracting the new pixel value from the pixel value of a pixel located at the center of the upper row to obtain the first difference; and

subtracting the pixel value of a pixel located at the center of the lower row from the new pixel value to obtain the second difference.

13. (CURRENTLY AMENDED) The image processing apparatus according to ~~claim 4~~ claim 8, wherein said energy calculating means creates an energy map based on the difference between pixel values obtained from pixels that are located diagonally from one another in said original image.

14. (CANCELED)

15. (CANCELED)

16. (NEW) The image processing apparatus according to Claim 8, further comprising edge conversion means for converting a loose connection of said original image into a tight connection before said energy calculating means calculates said local energy.

17. (NEW) The image processing apparatus according to Claim 16, wherein said edge conversion means replaces the value of a particular pixel with a mean value corresponding to the respective values of two pixels lying on a diagonal line.

18. (NEW) The image processing apparatus according to Claim 8, wherein when said calculated local energy is greater than a predetermined threshold value, said edge enhancement means performs a one-dimensional filtering process through a one-dimensional edge building filter such that the value of each pixel is multiplied by a corresponding coefficient of a plurality of coefficients and the products of each respective multiplication are added together, and wherein the one-dimensional edge building filter coefficients include a scaling factor.

19. (NEW) The image processing apparatus according to Claim 8, wherein said interpolation means and said edge enhancement means perform the interpolation and the edge enhancement upon said original image in each of vertical and horizontal directions.

20. (NEW) The image processing apparatus according to Claim 8, wherein said interpolation means interpolates one new pixel from two pixels lying along the detected direction of the edge.

21. (NEW) The image processing apparatus according to Claim 8, wherein said interpolation means performs linear interpolation when the edge is not detected by said detection means.

22. (NEW) The image processing apparatus according to claim 8, wherein a parameter of said one-dimensional filtering process consists of said coefficients of a one dimensional edge building filter, and wherein the value of said coefficients is greater than 0.5, and less than 1.4.